We are in no danger of the theory of "*sanitas sanitatum omnia sanitas*" being pushed to excess by sanitary zealots; and for the present, at any rate, the teaching of the Rivers Pollution Commissioners has been nothing more than "take care of the sewage, and the water supply will take care of itself."

LIEUT. CAMERON IN CENTRAL AFRICA

THE first detailed news of the latter half of Lieut. Cameron's trans-African expedition was read at the Geographical Society on Monday night, in the form of extracts from letters of the explorer, who intends to remain at Loando until he has a chance of finding a genial climate here. We do not yet possess details sufficient to authorise us in drawing final conclusions as to the results so far as the great problem of Central African drainage is concerned; though we are quite justified in concluding that Lieut. Cameron has proved himself to be possessed of the qualifications of an explorer of the first rank, and that means ought to be found of making still further use of his valuable services. He has not been able to accomplish all he intended when he set out from Ujiji in March 1874, but he has certainly added very largely to our accurate knowledge of Central Africa. He was not able, owing to the hostility of the natives, and the want of pluck in his followers, to follow the course of the Lualaba in order to ascertain whether or not it joins the Congo. He has, however, obtained data which render it very improbable that the Lualaba and Tanganyika contribute to the Nile system; the only known outlet of the lake, the Lukuga, he has ascertained, flows into the Lualaba. This latter river at Nyangwè is only 1,400 feet above the sea, or 500 feet below the Nile at Gondokoro, and lies in the centre of an enormously wide valley, "which receives the drainage of all this part of Africa, and is the continuation of the valleys of the Luapula and Lualaba." Cameron found that the river, contrary to Livingstone's report, really turns to the west below Nyangwè, and the Arabs report that further down it flows W.S.W. A river, the Lowa, said to be as large as the Lualaba, at Nyangwè, joins it from the northward a short way farther down, besides other important rivers from the same direction. Cameron failed to make his way to Sankorra, a lake into which the Lualaba falls, and to which "trowser-wearing traders are reported to come in large sailing-boats to buy palm-oil and dust (probably gold) packed in quills."

Lieut. Cameron traces with considerable minuteness the course of the Lualaba to some distance below Nyangwè. He shows that the true Lualaba in its upper course is the river to the west of Lake Bangweolo, crossed by the Pombeiros in their trading journeys to Cassembe's Town, and that Livingstone's Upper Lualaba is properly called the Luvwa. The river receives many tributaries during its course to Nyangwè, and passes through a number of lakes, so that by the time it reaches its final destination it must be a river surpassed in volume by few others.

All this seems to indicate that the Lualaba reaches the sea on the west coast, but that it does so by means of the Congo it would at present be unsafe absolutely to assert, though if it do not, what other Central West African river is of sufficient size to carry off the immense drainage which the Lualaba evidently represents?

On account of the vexatious obstacles to his course along the Lualaba, Cameron turned southward, and during his journey south and then west to Benguela he made many valuable and accurate observations which will help greatly in filling up that portion of the map of Africa. Some distance south of Nyangwè he came upon a small lake Mohrya, fed by the rains, and apparently isolated from the rest of the water-system, but which is interesting as containing regular lake-villages. He is inclined to believe that the Albert Nyanza is much smaller than Sir Samuel Baker makes it, and he found that the Lomâmi has no connection with the Kassabè, as shown in the map published by Keith Johnston. In the southward march Cameron passed the sources of the Lulua, which runs into the Zambesi, whose sources he places in 23° E. long. and 11° 15′ S. lat.

Cameron gives the most glowing description of the productiveness of the country through which he has passed; coal was found, gold, copper, iron, and silver are abundant, and he is confident that with a moderate expenditure of capital "one of the greatest systems of inland navigation in the world might be utilised." Multitudes of tropical products abound, and the region is well adapted for the cultivation of extra-tropical ones. A canal, he thinks, of twenty to thirty miles in length, would connect the Congo and Zambesi systems, and the resulting commercial advantages would be enormous. So the enthusiastic traveller believes, and whatever may be the results in this direction, the gains which have accrued to accurate geographical knowledge from his journey are such as must earn him the warmest thanks of the friends of science. He has taken 400 observations, "and consequently," as Sir Henry Rawlinson remarked, "has soundly established all the geographical landmarks of the country."

MORELL'S "EUCLID SIMPLIFIED"

Euclid Simplified. Compiled from the most important French works, approved by the University of Paris and the Minister of Public Instruction. By J. R. Morell, formerly H.M. Inspector of Schools. (London: Henry S. King and Co., 1875.)

EUCLID simplified! "My friend M., with great painstaking, got me to think I understood the first proposition in Euclid, but he gave me over in despair at the second." Had Elia lived in these days of modern geometries perchance he had been a moderate geometer, but his wit might have been dulled. The book before us, however, is not the book we should recommend to a sucking geometer. We look upon it as one of those private ventures which we hope the Association for the Improvement of Geometrical Teaching will extinguish. There is hardly a page without its crop of faults. The title we consider to be a misnomer, for the method of Euclid (the geometer) is departed from altogether. We should look to find in a "Euclid Simplified" something far different from this. The treatise is based upon good geometrical authorities, as will be seen by a reference to the prefatory remarks; it is to the form in which these authorities are presented that we object. Who is the interpreter? A former "H.M. Inspector of Schools." We have been wont to look upon these gentlemen as masters of one or more tongues, and as having a fair acquaintance with the "ologies." We have not formed a high opinion of the geometrical attainments of this compiler, nor do we consider him to be well versed in the French language, or even in elegant English composition. "Quis custodiet ipsos custodes?" It is "a work offered for the use of schools;" it is essential, then, that the writer should take all due precaution to be accurate. We think, further, that he should rather be disposed to retain terms with which boys are fairly acquainted, if they are correct, than to be constantly using terms and phrases which betray their Gallic descent. Thus pp. 23, 55: "angles are equal *as opposed at* the summit;" p. 40: "this corollary *gives occasion to*;" pp. 110, 112: "shows that to *have* point *c*;" p. 141: "operating in the same *measure*" (? way); p. 166: "three points taken in *equal number* on the sides of a triangle and in *unequal number* on its sides produced;" p. 168: the centre of similitude is the *meeting-place*," &c.; we shall get to rendezvous in time. The words "passing *by* a point" (*par*) occur repeatedly; on p. 108 we have "*by* point *D* draw in like maner (*sic*);" pp. 41, 42, furnish "perpendicular to the centre," "perpendicular to the middle," and so on.[*] It is hardly good English to say one point becomes confounded with another point, pp. 46, 97, 127; the boy-mind is apt to confound the different steps of the reasoning, and the boy often is tempted to exclaim, "Confound it altogether." "Cord" of a circle would not be difficult to make out by one who had read French mathematics, but at a "spelling-bee" we should prefer the candidate who spelled it "chord." But to return to the prefatory remarks. These have no signature, so we cannot be sure that it is Mr. Morell who writes "it is anticipated that it will prove more practically useful than most other school-books on the subject." We should expect, too, some recognition of the work accomplished by the association referred to above, the more so as Mr. Morell was at one time a member of the association. We should have been disposed to think that he has employed some one to make the compilation and translation, and has not carefully revised the work himself; but then against this we have the title-page. Were we to note and comment upon every passage we have marked, we should tire our readers. We shall content ourselves with culling a few elegant extracts. Many of the enunciations are loosely, if not always incorrectly, worded. Parallels are treated of in p. 21 before any definition of them has been given. On p. 24 we are told the term *transversal* is new to English schools: "it explains itself," and we are favoured with its derivation; in like manner, on p. 73 we are informed that *harmonics* have been "recently introduced in French geometry;" in the same note a specimen is given of "the new and interesting treatment of this question (*i.e.* harmonics) abroad;" on p. 72 we have a note on the word *capable*; "this term—used in French treatises—explains itself, if traced to its Latin root, *capax*, holding, a segment capable of an angle = a segment holding an angle." And on p. 104: "this circumference, by the well-known construction of the capable angle, will pass by point *B*."

A parallelogram is defined to be a quadrilateral, of which the opposite sides are *equal*; in theorem xxxi. he subsequently proves this. The term *lozenge* is used in the text, and a note tells us that the figure is called "*rhombus* in the old-fashioned Euclid." A terrible mess is made of *circumference* on p. 36. "*The* circumference is a plane line, of which all the points are equally distant from one same point situated in the middle and named centre." This is not so bad as the common school-boy definition: "a circle is a plain figure bounded by one straight line, and is such that all straight lines drawn from a certain point in its centre to the circumference are equal;" but it is not what we should expect in a text-book for boys. Again, "a circumference is generally described in language by one of its radii." The italicised *the* is easily accounted for when we remember the source from whence the definition is taken; here, of course, it ought to be *a*, but on p. 51 we ought to have *the* for *a* ("A polygon is inscribed in a circle when its summits are situated on the circumference). Reciprocally (Mr. Morell's term for the usual conversely), *a* circle is said to be circumscribed round *a* polygon," that is, the circle and polygon previously mentioned, otherwise the definition is incomplete. No distinction is made of *major* and *minor* arcs. Thus, p. 39: "of two unequal arcs the greater is subtended by the greater chord;" this is, of course, only true of minor arcs. On p. 66 he bisects a given arc without having shown how to bisect a given line. On p. 70 *C*, *C′* have been wrongly printed in three places. On p. 81 homologous is derived from *ὁμοίος* and *λόγος* (p. 9, isosceles from *ἴσος* is doubtless an oversight). On p. 85 occurs a passage we cannot understand; he has a quadrilateral *A B C D*, and then draws *E F* (*E* on *A B*, *F* on *C D*) parallel to *B C*; he says rightly the angles of the two figures are equal, but the sides not in the same proportion; then he proceeds to say "in like manner, without changing the four sides *A B*, *B C*, *C D*, (*sic*), point *B* can be brought near or removed from *D*, without changing the angles." We cannot understand it, and so do not see it.

In the first note on p. 91, boys are informed that M. Chasles is "Professor of Superior Geometry at the Collége de France, and one of the first geometers of the present age;" in the second, "homothetie" is derived from *ὅμοιος* and *θέσις*; in the third, "radiivectors or vectores are the straight lines drawn from the two foci of an ellipse to any one point of the circumference of an ellipse." On p. 122 we are told that the ratio of the equilateral triangle inscribed in a circle to the radius is $\sqrt{3}$, whereas it ought to be (as is proved in the text) the ratio of the side of the equilateral triangle, &c. On this page, and also elsewhere, we have *R* used for a right angle; this is, we think, likely to mislead boys: nor do we approve of the expression, "each of these angles will be *worth* $\frac{2}{3}$ *R*." *R* is usually employed to denote the radius of the circumscribing circle of a triangle. Pages 132, 133, bristle with blunders, due partly to the editor, but principally to the printer. On p. 134, for "pentagon" read "pentedecagon" (a purism for "quindecagon"). Page 136, on the calculation of the ratio of the circumference to the diameter, we read: "The complete solution of this problem belongs to superior mathematics. Therefore it is here less aimed at giving a method to calculate this ratio than to give a notion that it is possible to do so." This last sentence strikes us as not being particularly elegant. On pp. 144, 145, in the proof of the important proposition that the ratio of any two rectangles *R* and *R'* is the same as that of the product of the height and base of the first, to the product of the height and base of the second, there are two, at any rate typographical, errors which would exceedingly trouble boys or the ordinary run of self-taught students. Also in a numerical example to this proposition the writer correctly gets $\frac{R}{R'} = 4\frac{1}{2}$, and then says the first rectangle is $4\frac{1}{2}$ times *greater than* the second rectangle. On p. 148 the reasoning in theorem vi. is defective, and in the scholium there is a misprint; it is, however, not necessary to dwell fully on this Book V., which is especially faulty. We shall close our remarks on the text by quoting a sentence on p. 171, simply remarking that we could have extended our criticism to twice or thrice the dimensions of the present notice. The sentence is: "The further development of the Theory of Transversals is reserved for a special treatise on Modern Geometry, with a popular view of the recent improvements introduced by M. Chasles." May it be reserved to the Greek Calends! say we. Who and what is Mr. J. R. Morell, that he should venture to act as interpreter of M. Chasles' brilliant contributions to Geometry? Such a work brought out by a competent writer would be of great use. It was in 1871, that Mr. Morell published "The Essentials of Geometry, Plane and Solid, as taught in French and German Schools, with Shorter Demonstrations than in Euclid," &c. After the reception this little work met with one would have hoped that the author would have learnt wisdom, and before he sent forth another such work into the world would have submitted it to one or two candid and competent geometrical friends. The book might yet be made a very fair one, but as it is at present we must condemn it most strongly.

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[*] For pp. 11, 20, "two triangles are equal *as having* an equal angle,' &c., we should prefer "*because* they have," &c.

There is an appendix of 205 exercises, and we have marked upwards of forty as each containing something objectionable in language or in geometry. We must content ourselves with a selection:—30. Given a rectangle and a point *situated in the interior of a quadrilateral;* it should be "and a point within it" (or some such words; it is the billiard-table question which is given in many French text-books). 40. A triangle and any plane figure, *in general movable in a plane*, &c. 42. *Which* is the geometrical *locus*, &c. 103. A question of two concentric circles: in the *great* circle, in the *little* one. 116 is not neatly put; it is, "What is the geometrical *locus* of the centres of the circles which intersect *orthogonally*—that is, forming a right angle—two given circles?" 143, 193, he uses *in the function*, where an ordinary geometer would write *in terms of. In such wise* and *in* (for "into") frequently occur. Before closing our article, we must point out that the work we have examined is not to be *confounded* with "The Elements of Geometry in Eight Books; or, First Step in Applied Logic," by L. J. V. Gerard, which forms a volume in Dr. J. D. Morell's Advanced Series for Colleges and Schools. This is the work of an able and judicious writer; we must at present content ourselves with merely commending it to the notice of any of our readers interested in the subject. A word of praise we can extend to the external aspect of "Euclid Simplified;" it has a neat and geometrical design on the cover.

TISSANDIER'S PHOTOGRAPHY

A History and Handbook of Photography. Translated from the French of Gaston Tissandier. Edited by J. Thomson, F.R.G.S. (London: Sampson Low and Co., 1876.)

ALTHOUGH one may reasonably object to the statement made by an eminent French *savant* that "chemistry is a French science," there is no denying the fact that photography, so far as its early history is concerned, is eminently a French art. M. Tissandier, the author of the work now before us, of course does not fail to impress this fact repeatedly upon his readers by speaking of photography as the "art of Daguerre," and indeed throughout the book he places his own countrymen in positions which might in some cases be justly considered as somewhat too prominent. The addition of some few historical notes, however, by Mr. Thomson, the editor, renders the work, on the whole, as fair a history of the subject as we could wish to read.

Of the three parts into which the book is divided the first is entirely historical, commencing with a description. of the camera obscura of Porta, and the discovery of "Luna Cornea" by Fabricius, and then proceeding to the early experiments of Prof. Charles, Wedgwood, Davy, and Watt. The connection of Daguerre with the first development of photography is of course known to all. The early life of Daguerre forms the subject of the second chapter, and the author here relates an incident which may be new to many of our readers.

It seems that in 1825 a poorly-dressed young man entered the shop of Charles Chevallier, which was at that time much frequented by amateurs, and demanded the price of one of the new cameras with converging meniscus lenses, which were then being made for the first time. The young man's manner showed that the price named was far above his means, and Chevallier then inquired for what purpose he required the camera. The stranger declared that he had succeeded in fixing the image of the camera on paper, but that the instrument he had employed was of rough construction, and he was anxious to continue his experiments with the improved apparatus. Chevallier being sceptical as to this statement, the young man placed on the counter before him a piece of paper, on which appeared a view of Paris, and on further questioning gave the optician a vial of blackish fluid, which he stated to be the liquid with which he operated. To continue, in the author's own words:—"The unknown explained to the optician how he should go to work; then he retired lamenting his hard fate, which would not permit him to possess that object of his dreams, a new camera! He promised to return, but disappeared for ever." It may be added that Chevallier could get no result with the liquid left with him. The incident was related to Daguerre, but the unknown inventor never appeared again, so that his name and fate remain a mystery. The succeeding chapters contain an account of the life and labours of Nicephore Niepce, and a history of the partnership entered into between this gentleman and M. Daguerre. Niepce's process, it will be remembered, depended upon the fact that "Bitumen of Judæa," when exposed to light, becomes insoluble in oil of lavender. Daguerre, continuing his researches under the